

To explore the relationship between computational time and polynomial form, consider three forms of the same polynomial

$$f_1(x) = x^5 - 15x^4 + 85x^3 - 225x^2 + 274x - 120 \quad (\text{normal})$$

$$f_2(x) = (x - 1)(x - 2)(x - 3)(x - 4)(x - 5) \quad (\text{factored})$$

$$f_3(x) = -120 + x(274 + x(-225 + x(85 + x(-15 + x)))) \quad (\text{nested})$$

We can evaluate each function at 1000 randomly generated points (to be used for all functions and all replicates) and, using an R package called `microbenchmark`, repeat this experiment 1000 times for each form. Results of this experiment are given in Figure 1.

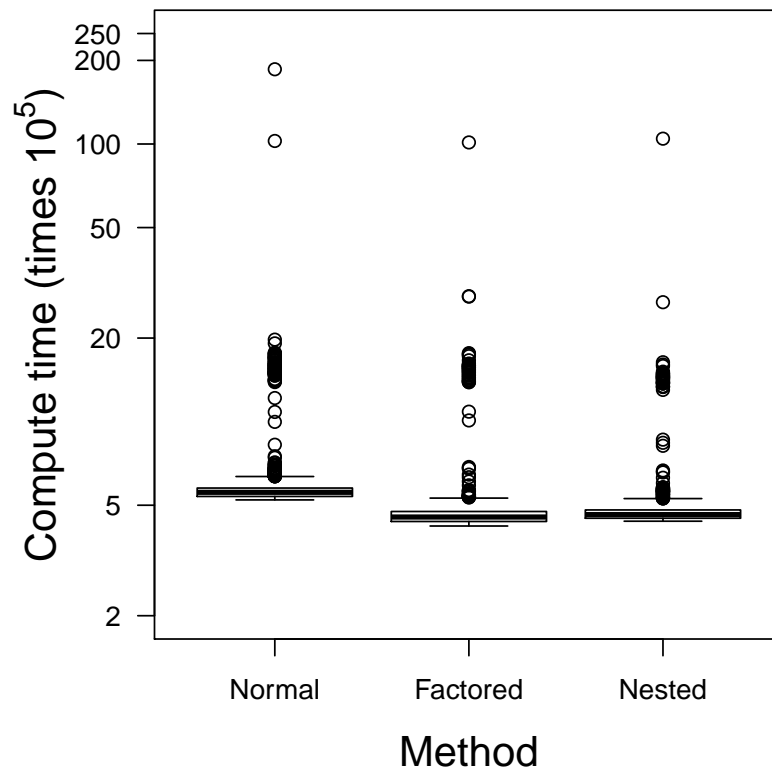


Figure 1: Median computing times (measured execution time in microseconds) are 607.1064 for f_1 , 511.8887 for f_2 , and 516.9337 for f_3 .

With respect to class, you might ask yourself why we have emphasized nesting, but not factoring, when it comes to working with polynomials.